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EINSTEIN

This volume is the first systematic presentation of the work of Albert Einstein, comprised of fourteen essays by leading historians and philosophers of science that introduce readers to his work. Following an introduction that places Einstein's work in the context of his life and times, the book opens with essays on the papers of Einstein's "miracle year," 1905, covering Brownian motion, light quanta, and special relativity, as well as his contributions to early quantum theory and the opposition to his light quantum hypothesis. Further essays relate Einstein's path to the general theory of relativity (1915) and the beginnings of two fields it spawned, relativistic cosmology and gravitational waves. Essays on Einstein's later years examine his unified field theory program and his critique of quantum mechanics. The closing essays explore the relation between Einstein's work and twentieth-century philosophy, as well as his political writings.

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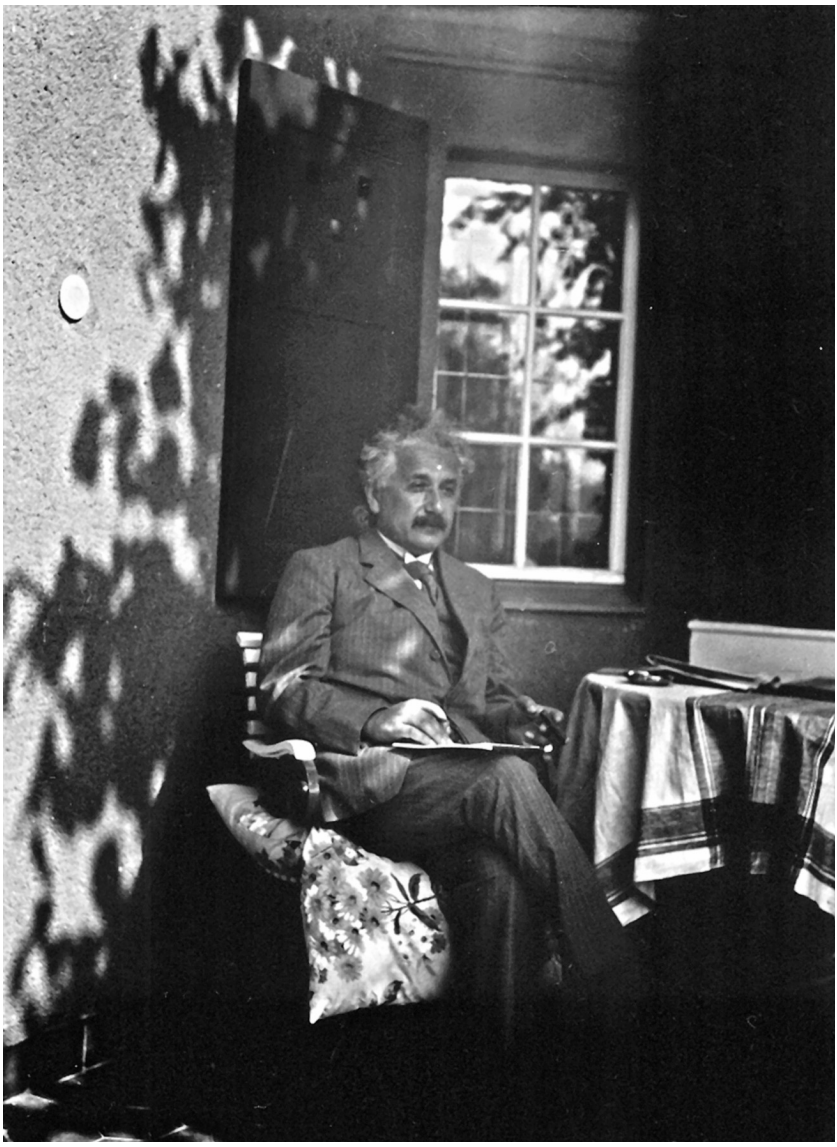

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The editors dedicate this volume to the memory of Gregory Swain Nelson (16 May 1964–23 September 2012).

Where the world ceases to be the arena of personal hopes, wishes and wills, where we face it as free beings, admiring, questioning, contemplating, there we enter into the realm of art and science.

Albert Einstein, "The common element in artistic and scientific experience," *Menschen* 4 (1921)

Contents

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Preface

MICHEL JANSSEN AND CHRISTOPH LEHNER

Most volumes in the *Cambridge Companion* series deal with philosophers. Following volumes on Galileo, Newton, and Darwin, this is the fourth *Companion* devoted to a major scientist. The inclusion of figures such as Galileo, Newton, and Einstein in this series reminds us that natural philosophy traditionally included what we today call physics, and that up to the middle of the twentieth century a clear border between physics and philosophy did not exist. Few would dispute that Einstein was the greatest natural philosopher of the twentieth century in this traditional sense. Not only was he centrally responsible for the formulation of the two most important fundamental theories of modern physics, the theory of relativity and quantum theory, he also devoted considerable effort to explaining and defending his views on the epistemology and methodology of physics. His writings have had an enormous impact on the development of philosophy of science in the twentieth century, and beyond that on analytic philosophy more generally. Many of the philosophers relevant for the rise of analytic philosophy in the first half of the twentieth century, especially in the German-speaking countries, such as Moritz Schlick, Hans Reichenbach, Rudolf Carnap, or Karl Popper, were concerned with interpreting and developing Einstein's work in a general philosophical context.

This volume is meant to provide an introduction to Einstein's work that is comprehensive and accessible to the general reader. Most of the chapters in this volume deal with Einstein's pathbreaking contributions to physics, in relativity theory, quantum theory, and statistical physics. However, there are also several chapters on Einstein's reflections on the foundations of physics (especially quantum mechanics), scientific methodology, epistemology, and politics. In the introduction to this volume, we provide a more detailed guide to its contents. Here we want to acknowledge some of the more important debts we accrued in putting together this *Companion*.

The volume has been a long time in the making. We appreciate the patience and forbearance of our contributors and the editors at the Press. Don Howard first suggested that the two of us edit *The Cambridge*

Companion to Einstein. George E. Smith gave us useful advice early on based on his own experience editing *The Cambridge Companion to Newton*. The reader will notice that many of the authors who contributed to this volume, including its two editors, have been involved in one capacity or another with the Einstein Papers Project. The editorial team of this project, now based at the California Institute of Technology, is responsible for the publication of *The Collected Papers of Albert Einstein*, thirteen volumes of which have appeared so far. We are grateful to Diana Kormos Buchwald, the Director of the Einstein Papers Project, for her unwavering support of work on this volume. The Max Planck Institute for the History of Science in Berlin is another major site for Einstein studies. The production of this volume has been part of the activity of Department I of the Institute in this area. We are therefore extremely grateful to Jürgen Renn, its Director, for his generous support and constant encouragement. The cumulative bibliography and the index for this volume were prepared by scholars and staff at the Max Planck Institute. We thank Martin Jähnert and Lindy Divarci for their meticulous work on the bibliography, and Irene Colantoni, Chandhan Srinivasamurthy, and Ross Fletcher for helping us compile the index.

At various points we benefited from the advice of two senior Einstein scholars, Robert Schulmann and John Stachel, though they bear no responsibility for what we did or failed to do with it. One of us (MJ) would like to thank his colleagues in the Program in the History of Science, Technology, and Medicine at the University of Minnesota, especially the program's former director, Alan E. Shapiro. We thank Laurent Taudin for drawing the figures for several chapters and the appendix of this volume. We also thank the staff at Cambridge University Press, especially Beatrice Rehl, Asya Graf, Christine A. T. Dunn, and Emily Spangler, for shepherding our manuscript through the production process.

Finally, we want to express our gratitude to the Hebrew University of Jerusalem for granting us permission to quote from material in the Albert Einstein Archives and for allowing us to reproduce two pictures of Einstein, one on the cover and one as a frontispiece. We thank Chaya Becker of the Albert Einstein Archives for suggesting these two pictures to us. Both were taken in Berlin in 1928. The first somewhat blurry one, used as the frontispiece, shows Einstein squinting as if deep in thought, holding his pen ready to record the solution to whatever riddle he is contemplating in the notebook on his lap. The second one, used on the cover, appears to have been taken moments later, is in sharp focus, and shows Einstein fully relaxed, approvingly looking, it seems, at what he just jotted down in his notebook. This pair of images nicely captures the spirit of the man to whose work this volume is devoted.